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(54) Medication packaging apparatus

(57) A medication packaging apparatus for packaging solid medications is disclosed and includes a plurality of tablet cases which hold solid medications separately by type and a turntable which is located under the tablet cases onto which medications dispensed from the tablet cases fall and which are gathered by a guide around the circumference of the turntable by centrifugal force. The guide has a dispensing port through which the medications fall into small bags. A heat sealing mechanism forms the small bags in succession from a roll of thermally weldable packaging paper. The mechanism for collecting the medications which have been released from the tablet cases can be made thinner and an overall reduction in size of medication packaging apparatus is achieved.

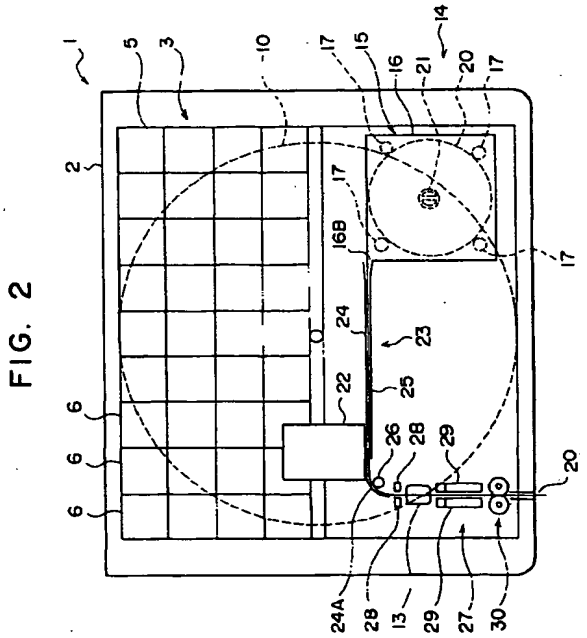

FIG. 2

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Description

The present invention relates to a medication packaging apparatus and more specifically but not exclusively to an apparatus used for packaging tablets, capsules, pills, lozenges and any other solid medications specified by prescriptions at hospitals and pharmacies in packaging paper.

Tablet or other solid medication packaging machines as disclosed in, for example, Japanese patent publication No.3-59, are used in hospitals to divide the tablets for each dose prescribed by a Doctor which are then packed before supplying them to a patient. However, such a divide-and-pack method is basically designed to dispense tablets for each does and collect them using a hopper or conveyor to package them, thus increasing the length of time required to complete packaging of the tablets. Moreover, the whole apparatus is unavoidably large because the hopper or conveyor relies solely on gravity to collect the tablets.

In an alternative type of conventional tablet filling apparatus, the tablets prescribed for a patient are fed into containers such as vials or bags. This type of tablet filling apparatus has a plurality of tablet cases arranged like a row of lockers but with each case slanted down to the front, each case filled with a different type of tablet. A dispensing mechanism associated with each tablet case is operable to dispense the tablets according to a prescription.

This type of tablet filling apparatus is faster than the aforesaid tablet packaging machine since it does not divide the tablets by dose. However, it is necessary for the operator to fill a container with the tablets released from the dispensing mechanism which can become extremely complicated and time consuming especially when there are many different types of tablets. Furthermore, the overall size of the tablet filling apparatus is still relatively large.

Accordingly, the present invention seeks to solve or substantially alleviate the problems with the prior art discussed above by providing a medication packaging apparatus which enables medications to be packaged quickly and allows for a reduction in size of the whole apparatus.

According to one aspect of the present invention there is provided a medication packaging apparatus comprising a dispensing port, means for dispensing selectable doses of solid medications through the dispensing port, means for feeding packaging sheet material past the port, and sealing means for sealing the doses of medications dispensed through the port in individual bags formed from the packaging sheet material.

Preferably, the packaging sheet material fed past the port is folded lengthwise to form two layers having a closed edge and the solid medications dispensed through the port at sealed between the layers of the packaging sheet material.

In the preferred embodiment, the packaging sheet material is made of thermally weldable paper and the sealing means is a heat sealing mechanism.

According to a second aspect of the present invention, there is provided a medication packaging apparatus comprising a plurality- of tablet cases for holding medications separately by type, a turntable which is located under the tablet cases and which rotates to receive the medications dispensed from the tablet cases, a guide provided around the turntable, a dispensing port which is formed on the guide, packaging paper which has been wound into a roll and which is thermally weldable, and a heat sealing mechanism for forming continuous small bags by heat-sealing the packaging paper wherein the medications dispensed through the dispensing port are placed in the packaging paper, then the heat sealing mechanism seals the packaging paper. With this arrangement, a thinner mechanism may be used for collecting the medications dropped from the tablet cases, allowing a reduced size of the entire medication packaging apparatus. This will contribute to effective use of limited, valuable spaces at facilities such as hospitals and pharmacies.

In a preferred embodiment of the present invention, the medication packaging apparatus further comprises feeding means for feeding the mounted roll of packaging paper, a guiding means for guiding the fed packaging paper to a predetermined position, and a pull-in means for pulling the leading edge of the packaging paper which has been guided by the guiding means. This arrangement allows the packaging paper to be automatically fed out without human aid and threaded in the predetermined position once the roll of packaging paper-is mounted in place. Hence, it is no longer necessary to manually set the roll of packaging paper in place, thereby markedly shortening the time required for mounting or replacing the packaging paper.

Conveniently, the leading edge of the roll of packaging paper is provided with a hard section of a predetermined dimension. This reduces the possibility of the leading edge of the packaging paper bending and ensures that it is fed smoothly to contribute to reliable and smooth automatic threading of the packaging paper.

In yet another aspect of the present invention, there is provided medication packaging apparatus comprising a plurality of chambers for separately holding different types of solid medications, a turntable located beneath the chambers onto which the solid medications dispensed from the chambers fall under gravity, guide means provided around the circumference of the turntable for guiding the solid medications to a dispensing port and means for packaging the solid medications dispensed from the dispensing port.

A preferred embodiment of the present invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a longitudinal sectional side view of a medication packaging apparatus in accordance

with the present invention;

Figure 2 is a top sectional view showing the medication packaging apparatus in accordance with the present invention;

Figure 3 is a perspective view showing a medication packaging mechanism of the medication packing apparatus in accordance with the present invention;

Figure 4 is a longitudinal section front view showing a tablet case assembly of the medication packaging apparatus in accordance with the present invention; and

Figure 5 is a side view showing a heat sealing mechanism of the medication packaging apparatus in accordance with the present invention.

Referring now to the drawings, a medication filling apparatus 1 according to the preferred embodiment for installation at a hospital, pharmacy or the like is constituted primarily by a medication holding mechanism 3 and a medication packaging mechanism 14 provided below the medication holding mechanism 3 installed in a rectangular outer case 2. The medication holding mechanism 3 has a tablet case assembly disposed at the top inside the rectangular outer case 2 and is provided with a top table 4 which pivots upwardly to enable the tablet case assembly 5 to be opened and closed.

Housed within the tablet- case assembly 5 are a plurality of tablet cases 6. Sub-holders 7 are provided at the front top thereof and are used to hold medications such as tablets which have been cut into halves that cannot be held in the tablet case 6. A belt conveyor (not shown) which may be connected using a chain, gear, or the like, is driven by a belt 9 mounted on the pulley of a rotary shaft (not shown) of a motor 8. The belt conveyor is provided with a plurality of continuous holding sections 7A.

Dispensing and counting devices (not shown) comprised of photosensors, etc. are provided beneath and in communication with each tablet case 6, and a motor-driven dispenser drum is incorporated therein. A plurality of vertical grooves are formed on the side surface of the dispenser drum, so that solid medications such as tablets, capsules, pills and lozenges are vertically aligned in each of the grooves. As the dispenser drum rotates, the medications in each groove drop one by one and are counted by the counting device.

On one side of the sub-holders 7 there is formed a dropping passage 7B which is communicated with a turntable 10 and is discussed in more detail hereafter. The medications mentioned above are held in the holding sections A of the sub-holder 7 and as the motor 8 is started by a switch operated by a user, the medications drop from the holding sections A through the drop passage 7B as shown by an arrow in Figure 4.

A disc-shaped turntable 10 for collecting the medications is provided below the tablet cases 6 and the drop passage 7B and has a surface area which extends beneath all the tablet cases 6 and the drop passage 7B. The surface 10A of the turntable 10 is conical in shape and is driven and rotated at a predetermined speed by a turntable motor (not shown) which is provided below the turntable 10. With this arrangement, the medications dropped from the tablet cases 6 and the sub-holders 7 can be collected on a guide 11 by centrifugal force on the circumference of the rotating turntable 10, thus enabling the mechanism for collecting the medications to be made extremely thin.

The annular guide 11 is positioned vertically around the circumference of the turntable 10 and a notch-shaped dispensing port D is formed therein at an appropriate point. A chute 13 which will be discussed hereinafter, is provided below the dispensing port D so that as the turntable 10 rotates, the medications gathered on the guide 11, i.e. toward the outer periphery of the turntable 10 drop onto the chute 13. The chute 13 is shaped like a cylindrical inverted cone and its upper end opening matches the dispensing port D of the turntable 10 and its open bottom end, i.e. the distal end, is inserted in folded packaging paper 20.

The medication packaging mechanism 14 is provided beneath the turntable 10 and is constructed of a feeding means for feeding out the packaging paper 20, a guiding means for guiding the fed-out packaging paper 20 to a predetermined position, and a pull-in means for pulling the leading edge of the packaging paper 20. The packaging paper feeding means is composed of a detachable housing case 15 and a feeding motor 18. The feeding motor 18 employs a servo mechanism which permits easy revolution control and is designed to run for a predetermined time and r.p.m. in response to a received input. A rotary shaft (hereinafter referred to as a "fitting shaft") 19 of the feeding motor 18 is detachably fitted to a hollow shaft 21, around which the packaging paper 20 is wrapped, in the housing case 15.

The packaging paper 20 which is adapted to hold and package medications will now be described. It is made of thermally weldable thin paper which uses, as an auxiliary medium, a thermally weldable material such as polyethylene which melts at a predetermined temperature. The packaging paper 20 has a predetermined width and has been creased and folded longitudinally before being wrapped around the hollow shaft 21 to provide a folded edge 20A and an opened section 20B composed of the two edges on the opposite side from the folded edge 20A (see Figure 3).

The leading edge of the packaging paper 20 is provided with a hard section 20C of a predetermined length which prevents the packaging paper 20 from being deformed easily when it is thread from a guide rail 23 to a pull-in roller 30. The hard section 20C is formed, for example, by thermally welding the whole area over the predetermined length from the leading edge of the packaging paper 20, i.e. the roll end of the packaging paper 20 which has been folded and wrapped around the hollow shaft 21.

The housing case 15 houses the rotatably mounted

packaging paper 20 in a main body 16 which is an enclosure. A through hole (not shown) is formed at about the centre of the bottom surface of the main body 16 and is made slightly larger than the fitting shaft 19 so that the fitting shaft 19 of the feeding motor 18 may be inserted. The inside of the main body 16 is provided with a plurality of guide rollers 17 of a predetermined cylindrical shape which are located within the four corners of the housing case 15 so that they extend from the bottom surface where the through hole is formed to the top surface. A slight gap exists between the outer peripheral surface of the roll of the packaging paper 20 and the guide rollers 17 so as to permit smooth rolling of the loaded packaging paper 20.

Provided beside one of the guide rollers 17 inside the housing case 15 is a feeding outlet 16B for feeding the loaded packaging paper 20 out of the main body 16. The feeding outlet 16B is slightly larger than the width and thickness of the packaging paper 20 so it may be easily fed from the housing case 15. When the packaging paper 20 is rotatably installed in the housing case 15 it is positioned so that the folded edge 20A is at the bottom whilst the open section 20B is at the top, with the hard section 20C slightly sticking out of the feeding outlet 16B of the housing case 15.

The medication packaging mechanism 14 is provided with a guide rail 23 which extends from the side of the housing case 15 and which serves as guiding means for the packaging paper 20 extending from the feeding outlet 16B of the housing case 15 which is disposed on the guide rail 23 side. The guide rail 23 is composed of two guide plates 24 and 25 (the guide plate 25 is not shown in Figure 3) which are approximately half the width of the packaging paper 20. A predetermined gap is provided between the guide plate 24 and the guide plate 25 to allow the packaging paper 20 to pass between them and is formed slightly larger at the end toward the housing case 15 to easily lead the packaging paper 20 drawn from the housing case 15, to the guide rail 23.

The guide plate 24 is provided with a curved section 24A on the opposite side from the housing case 15 and a tension roller 26 is positioned inside the curved section 24A with a predetermined gap between them. The tension roller 26 is movably installed in the direction away from the curved section 24A and is biased toward the curved section 24A by a predetermined working force applied by a coil spring, a flat spring, or the like (not shown). The other guide plate 25 is positioned between the tension roller 26 and the housing case 15 and is a predetermined distance from the tension roller 26. The position of the tension roller is detected by a switch (not shown).

The pull-in roller 30 serving as the pull-in means is provided ahead of the bent section 24A of the guide plate 24. The guide roller 30 consists of a pair of narrow rollers 33 and 33A made of natural rubber, synthetic rubber, or the like each mounted on the top of rotary shafts 32 and 34. The lower end of the rotary shaft 32 is attached to a pull-in motor 31.

The rotary shaft 34 of the other rubber roller 33A is biased by a coil spring or the like, (not shown) against the rubber roller 33 under a predetermined pressure, so that both rubber rollers 33 and 33A are driven as the pull-in motor 31 runs. The packaging paper 20 is held between the rubber rollers 33 and 33A and is drawn out from the housing case 15.

A heat sealing mechanism 27 is provided between the guide rail 23 and the pull-in roller 30. The heat sealing mechanism 27 seals the opened section 20B of the packaging paper 20 by thermal welding to divide and package medications corresponding to each dose and comprises a pair of pre-heaters 28,28 and a pair of main heaters 29,29 which are installed facing against each other with a predetermined gap between them. One of the pre-heaters 28 and one of the main heaters 29 are movable so that they may be pushed against or moved away from their counterparts. When electric currents are supplied to the pre-heaters 28,28 and the main heaters 29,29, they become hot to a predetermined temperature.

The main heaters 29,29 respectively have vertical sections 29A,29A and parallel sections 29B,29B; the parallel sections 29B are approximately as wide as the pre-heaters 28 while the vertical sections 29A are twice as wide as the parallel sections 29B. The pre-heaters 28 clamp the packaging paper 20 from both sides thereof and heat it to thermally weld it to the middle of the opened section 20B from the folded edge 20A of the packaging paper 20. It will be appreciated that the area indicated by the arrow drawn by a solid line in Figure 5 is not thermally welded in this step.

Then, the vertical sections 29A of the main heater 29 clamp either side of the packaging paper 20 and thermally weld the sides together-from the folded edge 20A to the opened section 20B to form a small bag 36A which has the opened section 20B between the pre-heaters 28,28 and the main heaters 29,29. The parallel sections 29B are adapted to thermally weld the opened section 20B and means that the thermal welding is carried out over the distance from the pre-heaters 28 to the main heaters 29.

After the packaging paper 20 is thermally welded by the heat sealing mechanism 27, it is moved a predetermined distance by rotation of the pull-in roller 30 in the direction indicated by the blank arrow shown in Figure 5. Thus, the part which has been thermally sealed between the pre-heaters 28 is positioned between the vertical sections 29A of the main heaters 29 which thermally weld the packaging paper 20 to form a small bag 36A one after the other, which is thermally sealed except the folded edge 20A.

When the packaging paper 20 is sealed from the folded edge 20A to the opened section 20B by the vertical sections 29A of the main heaters 29, perforations 37 is formed at about the middle of the width of the ther-

mally sealed section and extends the from the folded edge 20A to the opened section 20B. This thermally seals three sides of the packaging paper 20, the remaining side being the bent section 20A to complete the small bag with all sides thereof sealed. The small bag 36 can be separated from its adjacent bag at the perforation 37. A printer 22 prints the name, usage, etc. of the packaged medications on each small bag 36.

The operation of the medication packaging apparatus 1 will now be described. The aforesaid packaging paper 20 is loaded within the housing case 15 and the feeding motor 18, the lead-in motor 31 and the switch of the tension roller 26 are connected to a controller 35. When the packaging paper has been installed, the fitting shaft 19 of the feeding motor 18 is pushed through the through hole in the bottom surface of the housing case 15 and fitted into the hollow shaft 21 of the packaging paper 20.

With this arrangement, when an electric current is supplied to motors 18 and 31 by operation of a switch on the controller 35 the feeding motor 18 runs and the packaging paper 20 is unrolled and fed out through the feeding outlet 16B of the housing case 15 and the hard section 20C formed at the leading edge of the packaging paper 20 is fed between the guide plates 24 and 25 of the guide rail 23 toward the curved section 24A. When the hard section 20C of the packaging paper 20, reaches the curved section 24A of the guide rail 23, it passes between the curved section 24A and the tension roller 26 and between the pre-heaters 28,28 and the main heaters 29,29 until it finally reaches the pull-in roller 30 as shown by the dashed line in Figure 3.

When the packaging paper 20 reaches the pull-in roller 30, the two rubber rollers 33 and 33A of the pull-in roller 30 are pressed against each other and draw the packaging paper 20 from the guide rail 23 through the rollers 33,34. As the leading edge of the packaging paper 20 is provided with the hard section 20C it remains resistant to bending and does not deviate from the guide rail 23, the pre-heaters 28,28 or the main heaters 29,29 until it reaches the pull-in roller 30. This enables the packaging paper 20 to be guided and threaded automatically.

The running speeds of the feeding motor 18 and the lead-in motor 31 are set so that the movement of the packaging paper 20 when it is drawn in by the pull-in roller 30 is larger than the movement of the packaging paper 20 when it is fed out of the housing case 15 in order to apply a predetermined level of tensile force to the packaging paper between the housing case 15 and the pull-in roller 30. This causes the part of the packaging paper 20 which is positioned between the guide rail 23 and the pre-heaters 28 to deflect inward between the inner guide plate 25 and the pre-heaters 28. In other words, the tension roller 26 is deflected from the curved section 24A of the guide rail 23 or the guide plate 24 as indicated by the arrow in Figure 3.

Such movement of the tension roller 26 is detected by the aforesaid switch and the controller 35 stops the feeding motor 18 and the lead-in motor 31. At this point the bottom end of the chute 13 is inserted in the opened section 20B of the folded packaging paper 20 between the pre-heaters 28 and the main heaters 29.

When the controller 35 detects the movement of the tension roller 26 and stops the feeding motor 18 and the lead-in motor 31, no electric current is supplied to the feeding motor 18 and only the lead-in motor 31 operates until reloading of the packaging paper 20.

Thus, according to the preferred embodiment, once the housing case 15, which contains the packaging paper 20 provided with the hard section 20C at the leading end thereof, is mounted in the medication packaging mechanism 14, the packaging paper 20 is automatically fed and routed from the guide rail 23 to the pull-in roller 30 through the heat sealing mechanism 27. Hence, the conventional time-consuming complicated mounting and threading of the roll of packaging paper by hand is no longer necessary and almost no mounting failure of the packaging paper 20 occurs. This results in a marked reduction in the time required for loading or replacing the packaging paper 20, which in turn leads to shortened patient waiting time.

Moreover, the hard sect-ion 20C provided at the leading end of the packaging paper 20 minimizes the chances for the leading end of the packaging paper 20 to bend, permitting the packaging paper to be fed out smoothly along the guide rail 23 and enables more reliable and smoother automatic threading of the packaging paper 20.

When the power of the medication packaging apparatus 1 is turned on with the packaging paper 20 mounted therein, the count value of the dispensed medications and other values are reset and the pre-heaters 28 and the main heaters 29 are heated to a predetermined temperature and electric currents are supplied to rotate the turntable 10.

When an operator keys in prescription data to an input such as a personal computer (not shown) according to a prescription supplied by a Doctor, the dispensing drum for the tablet case 6 holding the required medication is driven and rotated and the medications of the specified type are dispensed one by one onto the turntable 10. The medications in the sub-holder 7 are also released onto the turntable 10 as required by the operator.

The medications which have been dispensed from the tablet case 6 are counted by the controller 35 according to the outputs of the photosensor and when the count value of the dispensed medications coincides with the number of the medications specified in the prescription data, the dispensing drum is stopped. The medications including the medications from the sub-holder 7 which have dropped onto the turntable 10 gather on the outer guide 11 by the centrifugal force of the rotating turntable 10 and fall into the chute 13 through the dispensing port D provided on the guide 11.

The medications then pass from the chute 13 into the small bag 36A of the packaging paper 20 located beneath the chute 13 after which the controller 35 operates the pull-in roller to pull the packaging paper 20 and the heat sealing mechanism 27 subsequently seals the bag by thermal welding as described above.

It will be appreciated that the pre-heaters 28 of the heat sealing mechanism 27 thermally weld the packaging paper 20 from the folded edge 20A to approximately halfway to the opened section 20B, leaving the top part unwelded (the part shown by the double ended arrow in Figure 5) to enable the packaging paper 20 to be drawn by the pull-in roller 30 in the direction indicated by the blank arrow in Figure 5 without requiring the chute 13 to be raised. When the packaging paper 20 stops moving, the main heaters 29 thermally weld the packaging paper 20 again to completely seal the medications in the small bag 36A. The moment the sealing of the medications in the small bag 36A is completed, the next batch of the medications is put in the next small bag 36A from the turntable 10 through t-he chute 13. A predetermined number of medications of the type specified in the prescription data are automatically packaged by repeating the process described above.

Thus, since the turntable 10 is rotated at the predetermined speed to gather the medications to the dispensing port D of the guide 11, even if the medications are released onto the turntable 10 from the tablet cases 6 and the sub-holders 7 at random they can be easily gathered at the guide 11 by the centrifugal force of the rotating turntable 10 and dropped through the dispensing port D into the opening of the packaging paper 20 via the chute 13. This arrangement enables the medication gathering mechanism to be made thinner and results in a reduction in size of the whole medication packaging apparatus 1, thus contributing to effective use of the limited, valuable space at such facilities as hospitals and pharmacies.

In the preferred embodiment the hard section 20C at the leading end of the packaging paper 20 has been formed by thermally welding the leading end of the packaging paper 20 for a specified length. However, the hard section 20C may alternatively be formed, for example, by putting paper, a vinyl material, or the like, which has the similar thickness and hardness to the packaging paper 20, in the folded packaging paper 20 and by thermally welding them.

As described in detail above, the turntable which rotates and receives dispensed medications is provided below the plurality of tablet cases which hold medications separately by type and a guide equipped with a dispensing port is formed around the turntable, the medications, which have been dispensed through the dispensing port, are put in packaging paper and the packaging paper is then sealed by a heat sealing mechanism. Therefore, the mechanism for collecting the medications, which have been released from the tablet cases, can be made thinner and the entire medication packaging apparatus can accordingly be made smaller.

Moreover, the mounted roll of packaging paper is fed out by the feeding means, the fed-out packaging paper is guided to the predetermined positions by the guiding means, and the leading end of the guided packaging paper is drawn by the pull-in means, therefore, once the roll of the packaging paper is mounted in place, the packaging paper can be automatically fed out and threaded as specified without the need for human aid. Thus, the conventional time-consuming complicated mounting and threading of the roll of packaging paper in the predetermined position by hand is no longer necessary, reducing the time required for loading or replacing the packaging paper.

Furthermore, since the -leading end of the roll of the packaging paper is provided with the hard section of a predetermined dimension, the leading end of the packaging paper is resistant to bending and ensures easy feeding of the packaging paper. Thereby allowing more reliable and smoother automatic threading of the packaging paper.

Thus, the medication packaging apparatus in accordance with the present invention is useful as a medicine packaging machine installed at a hospital, pharmacy, etc. in particular it is ideally suited for use at a small hospital pharmacy or other similar facilities.

Claims

1. Medication packaging apparatus comprising a dispensing port, means for dispensing selectable doses of solid medications through the dispensing port, means for feeding packaging sheet material past the port and sealing means for sealing the doses of medications dispensed through the port in individual bags formed from the packaging sheet material.

2. Medication packaging apparatus according to claim 1 wherein the packaging sheet material fed past the port is folded lengthwise to form two layers having a closed edge.

3. Medication packaging apparatus according to claim 2 wherein the solid medications dispensed through the port are sealed between the layers of the packaging sheet material.

4. Medication packaging apparatus according to any preceding claim wherein the packaging sheet material is made of thermally weldable paper and the sealing means is a heat sealing mechanism.

5. Medication packaging apparatus according to any preceding claim wherein the packaging sheet material is fed past the port by a motor which tensions the packaging sheet material.

6. A medication packaging apparatus comprising a plurality of tablet cases for holding solid medications separately by type, a turntable which is located under the tablet cases and which rotates to receive the solid medications dispensed from the tablet cases, a guide provided around the turntable, a dispensing port which is formed on the guide, packaging paper which has been wound into a roll and which is thermally weldable and a heat sealing mechanism for forming continuous small bags by heat sealing the packaging paper wherein the medications dispensed through the dispensing port are placed in the packaging paper, then the heat sealing mechanism seals the packaging paper.

7. A medication packaging apparatus according to claim 6 further comprising feeding means for feeding out a mounted roll of packaging paper, guiding means for guiding the packaging paper, which has been fed out to a predetermined position and pull-in means for pulling the leading edge of the packaging paper which has been guided by the guiding means.

8. A medication packaging apparatus according to claim 6 or claim 7 wherein the leading edge of the roll of packaging paper is provided with a hard section of a predetermined dimension.

9. Medication packaging apparatus comprising a plurality of chambers for separately holding different types of solid medications, a turntable located beneath the chambers onto which the solid medications dispensed from the chambers fall under gravity, guide means provided around the circumference of the turntable for guiding the solid medications to a dispensing port and means for packaging the solid medications dispensed from the dispensing port.

10. Medication packaging apparatus according to claim 9 wherein counting devices are positioned adjacent each of the chambers for counting the solid medications dispensed therefrom.